(No Model.)

3 Sheets—Sheet 1.

# D. A. SUTHERLAND.

## PROPORTIONAL WATER METER.

No. 351,721. Patented Oct. 26, 1886.

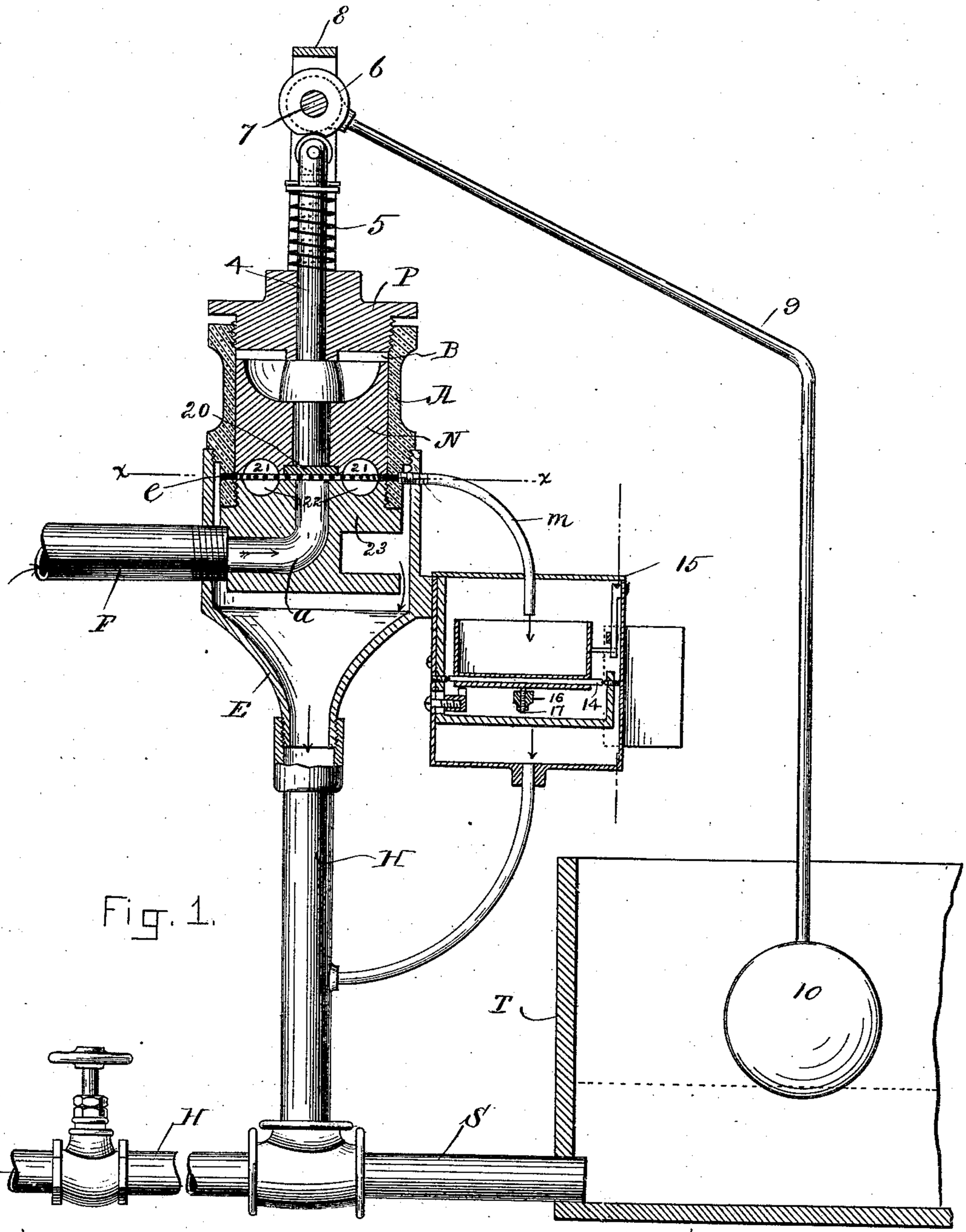


Fig. 1.

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INVENTOR:

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by

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(No Model.) 3 Sheets—Sheet 2.

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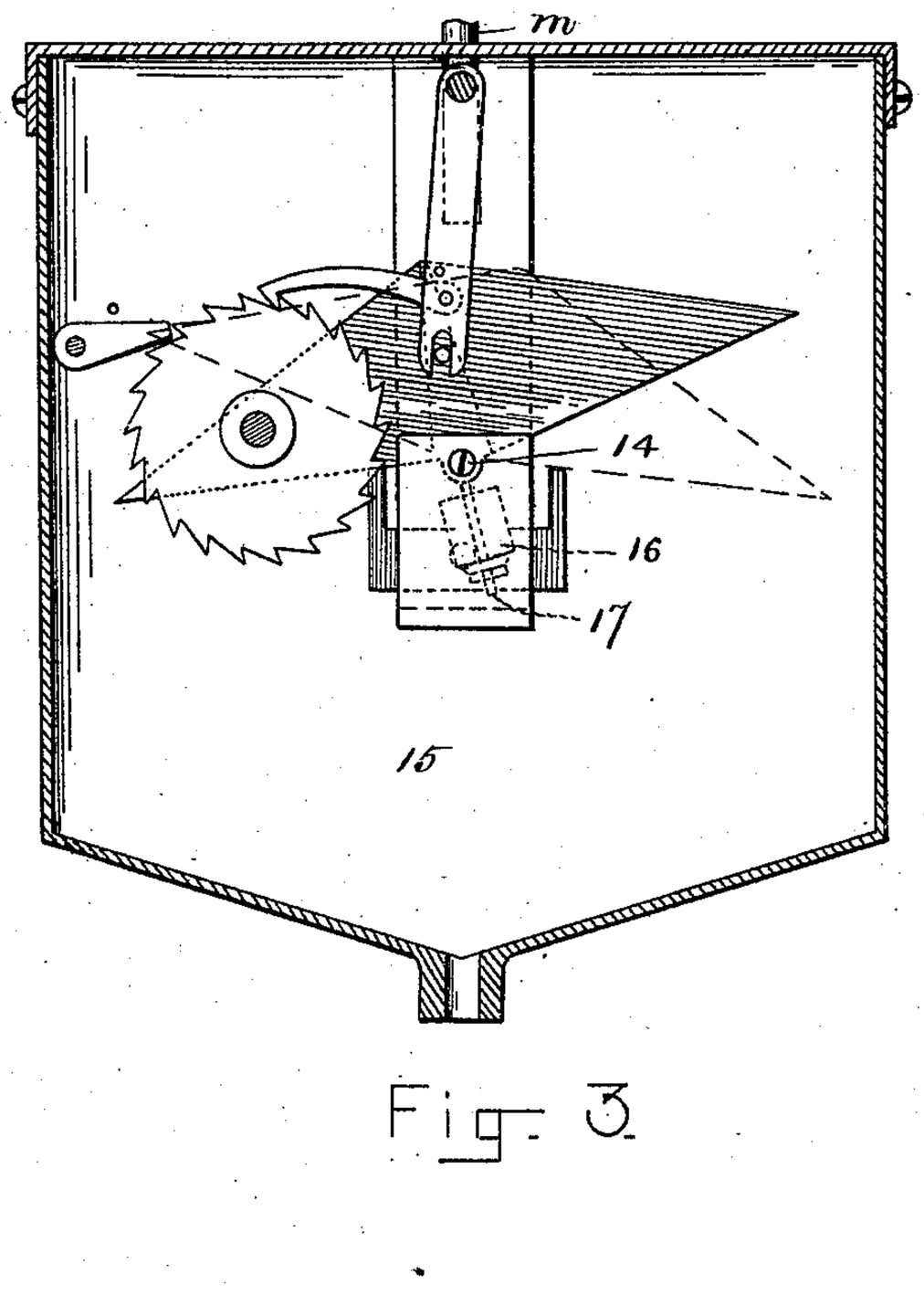


Fig. 3.

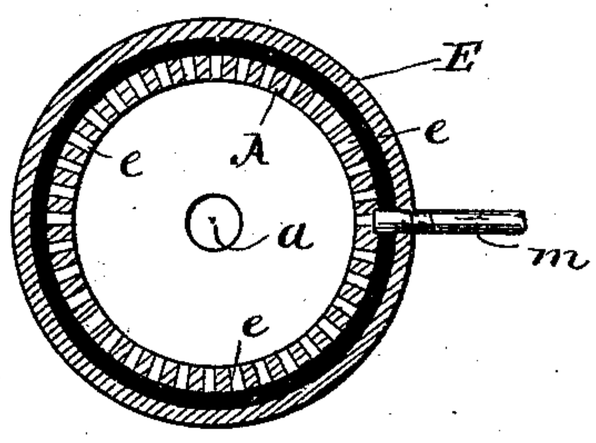


Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

# D. A. SUTHERLAND.

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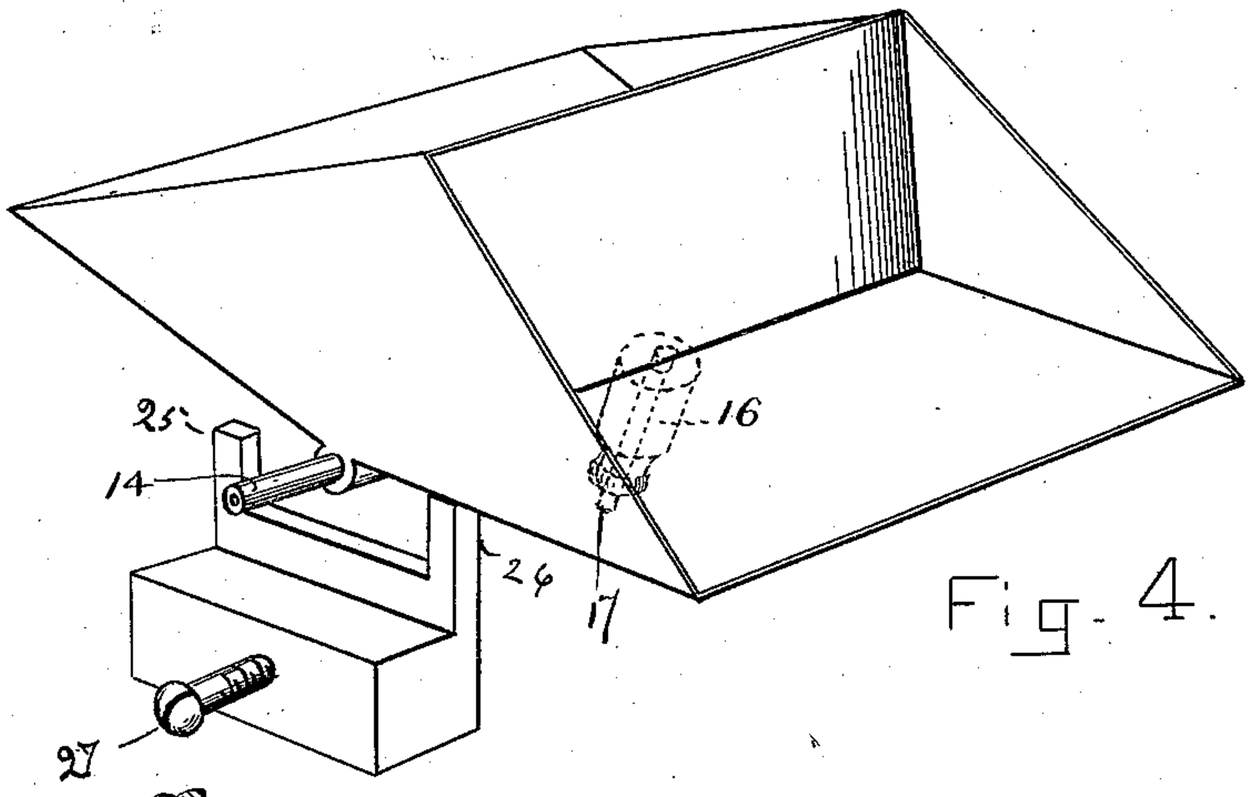


Fig. 4.

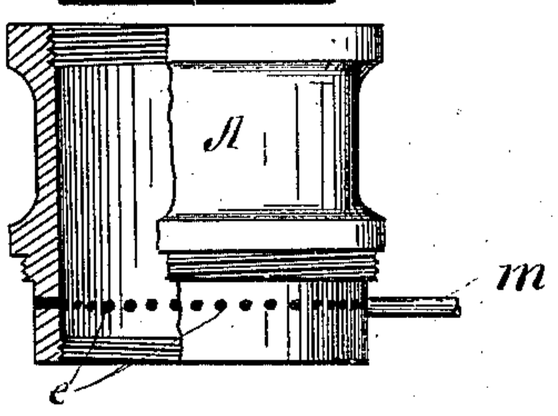


Fig. 5.

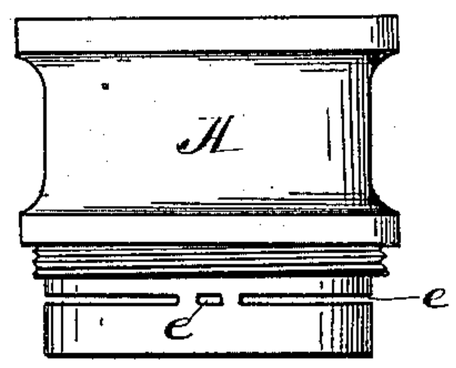


Fig. 6.

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# UNITED STATES PATENT OFFICE.

DANIEL A. SUTHERLAND, OF LYNN, MASSACHUSETTS.

## PROPORTIONAL WATER-METER.

SPECIFICATION forming part of Letters Patent No. 351,721, dated October 26, 1886.

Application filed February 1, 1886. Serial No. 190,549. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL A. SUTHERLAND, of Lynn, in the county of Essex and Commonwealth of Massachusetts, have invented certain Improvements in Water-Meters, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention has for its object to provide means whereby the quantity of fluid taken from a reservoir or pipe and delivered at some near or remote point of delivery may be conveniently and accurately determined.

The nature and construction of this invention are fully described and specifically claimed hereinafter.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation of my invention complete. This view comprises the distributing device in central vertical section, the measuring device, the connecting-pipes for conveying fluid to and from the same, also a tank, a float, and connecting mechanism for opening and closing the ports of the distributer. All of these mechanisms are specifically described hereinafter. Fig. 2 is a plan view of a section of the distributer, made on dotted line *x x* of Fig. 1. Fig. 3 is a side elevation representing the measuring-buckets and the mechanism for working the registering mechanism or indicator. (Not shown.) Fig. 4 is a perspective view of the measuring-buckets detached. Fig. 5 is a side elevation of the distributing device detached and partly sectioned to show the interior chamber thereof, and directly above the distributer is also shown in this view the follower or spigot that operates in this interior chamber of the distributer. Fig. 6 is also a side elevation showing a modified form of distributer.

The distributer A is preferably composed of non-corrosive material. It is formed with an interior chamber, B, leading into which is an induction-passage, *a*, and leading from which are two or more, preferably a series of, eduction-ports, *e*. The eduction-ports are preferably made equal to each other in size, as shown in Fig. 5. The bottom end of this distributer is inclosed in a conical-shaped shell or casing, E, as shown in Fig. 1. The supply-pipe F passes through the side of this shell and enters directly into the passage or channel *a*, thereby conveying the fluid directly into the chamber of the distributer, from which it escapes through the eduction-ports *e* into the chamber of the casing E, and passing downward it is conducted away by the delivery-pipe H to the delivery-faucet. Communicating with one of the eduction-ports *e* is the pipe *m*, by which all fluid exhausted through such port is conducted to a measuring device, (to be described hereinafter,) and the quantity thereof being ascertained by measurement, we have only to multiply this quantity by the number of the eduction-ports, all the ports being equal, to get the whole amount that passes through the distributer while this measured quantity was passing through the pipe *m*.

The interior chamber of the distributer is formed to receive the follower or spigot N, and the top of the chamber is closed by a cover or cap, P. The follower is allowed slight vertical movement in the chamber when the cap is screwed down. This follower is designed for opening and closing the ports of the distributer. When the follower is up, as in Fig. 1, the ports are all wide open, and, obviously, when the follower is depressed to the bottom of the chamber, the said ports are all closed, and as the ports are made of equal size vertically, at least, they will be opened and closed simultaneously in whole or in part by the up-and-down movement of the follower. It is only necessary for the follower to move sufficiently to cover the ports and lift away again, and if it is limited to this movement the durability thereof must be great.

The follower is provided with an annular groove, 21, in its bottom face that corresponds with a similar groove in the bottom of the distributer. This groove is designed for preventing a water-hammer when the follower comes down quickly.

Under the follower is a washer, 20, composed of hard rubber or other similar material, that serves as a cushion for the follower. Connected to the follower, and extended upward therefrom through the cap P, is a rod or spindle, 4, on which is a spring, 5. This spring bears, one end upon the cap P, and with its other end presses upward against a collar on the rod, and thus operates to lift the rod and consequently the follower, in order to open the ports of the distributer, as referred to hereinafter. On the end of said rod 4 is an anti-

friction wheel that bears upward on the periphery of cam 6, which is mounted on a rock-shaft, 7. This shaft is mounted in a suitable supporting-frame, as shown, and from the cam is extended a rod, 9, having on its bottom end a float, 10, which is located in a tank, T, and it may be lifted, by water rising in the tank, so as to turn the cam 6, thereby depress the rod 4, and consequently the follower N, and close the ports of the distributer. Obviously, when the level of the water in the tank is lowered, the float will fall with it, and the follower will be again lifted by the spring 5, as before. The tank T is connected by a pipe, S, with the delivery-pipe H, and from the foregoing description it will be understood that when the fluid enters the distributer through the induction-passage *a*, it passes out through the ports *e*, and thence down through the case E into the delivery-pipe H. If the delivery-pipe faucet or exhaust is closed, the water will flow upward into the tank T, and will accumulate therein till it rises sufficiently to lift the float 10 and turn the cam 6 and depress the follower N, and thus close the ports of the distributer. But suppose that water is now drawn from the delivery-pipe exhaust-faucet, the water will first exhaust from the delivery-pipe H, then from the tank T, (passing down through the pipe S,) until the water in the tank is lowered away from the float 10, and the spring 5 lifts the follower N and opens the ports of the distributer. The fluid will then pass through the distributer until the exhaust is closed and sufficient water accumulates in the tank to again lift the float and depress the follower, thereby closing the ports of the distributer and cutting off the flow, as before.

The water that passes through the port and the pipe *m* may be measured by any suitable measuring device; but the mechanism which I employ for this purpose, and would recommend to others, is fully shown in the accompanying drawings, and the same I will now proceed to describe. This mechanism comprises two buckets adjacent to each other, and mounted upon a rock-shaft, 14, as fully shown in Fig. 4. These ports, arranged as fully shown in Fig. 4, are placed in a suitable casing, 15. (See Figs. 1 and 3.) The shaft 14 is journaled to permit rocking motion for tilting the buckets. The amount of motion is limited by the stops 25 26, and may be modified by the screw 27, as shown. The buckets are balanced by a weight, 16, which is adjustably mounted on the rod 17, and may be so located on the rod as to balance a given quantity—say one ounce, more or less—of water in the bucket, and any excess of that quantity in the bucket will depress it, turn the shaft over, and empty the bucket—that is, allow the contents of the bucket to run out. These buckets are located under the pipe *m* in such manner that when either one of the buckets tilts over to empty its contents, the other bucket is by this operation brought up under the pipe to be filled, and vice versa. In this way all water that passes through the pipe *m* will be measured in one or the other of these buckets, which will be continuously filling and emptying so long as the ports of the distributer remain open. The fluid empties from these buckets directly into the case 15, and is conducted therefrom through a suitable pipe to the delivery-pipe H, or, instead of this, it may empty directly into the tanks T, or allowed to waste.

Connected with the shaft 14 is a mechanism consisting of the usual registering mechanism for registering the movements of the shaft upon an ordinary indicator. (Not shown.) These mechanisms are common, and will not be described here. In the distributer represented in Fig. 5, the eduction-ports *e* are equal to each other in size. This formation is the most desirable, as with this construction and arrangement the frictional conditions of passage of the liquid through the ports remain always the same and equal to each other, and the most accurate measurement can be secured with this construction. In Fig. 6 of the drawings, however, I have represented a modified form of distributer. This differs from the one already mentioned only in having the ports *e* unequal to each other in size. It has one small and one large port, *e*, and these ports are formed so that the water which passes through the smaller port will be one one-hundredth or other proportional part of as much as passes through the larger port at the same time. To this end due allowance must be made for the added friction developed by friction passing through the smaller hole—that is to say, the friction developed by fluid passing through the small hole will be more than one one-hundredth times as much as that of one hundred times as much passing through a hole one hundred times as large. Therefore, to get anything like exact measurement, the ports must be out of proportion sufficiently to compensate for this unproportional friction. This allowance can be easily figured when the size of either port is determined upon, and with the proper gradation of size the conditions are nearly equal, though, as before stated, I prefer to make the ports of equal size. The vertical measurement of the ports is equal in all cases, to insure the continuation of the gradation while the ports are being closed by the follower passing up and down before them. It will be observed that the supply-pipe and distributer are located above the delivery-pipe. This arrangement obviates the usual back-pressure and, further, allows the measured fluid to be exhausted back into the delivery-pipe below the measuring device, as shown in Fig. 1, and described above.

The object of this invention is to ascertain the quantity of fluid taken from a pipe or reservoir and delivered at the port of exhaust. To this end we regard the quantity passed through the measuring-port as the unit of measure, and if the ports are equal we have only to multiply this quantity by the number of eduction-ports and we get the desired result.

If the ports are unequal in size, we must multiply the quantity of water passed through the smallest port by the product of the size of this port, (less all allowance made to equalize the frictional condition of passage, as described,) divided into the size of all the eduction-ports added together.

What I claim as of my invention, and desire by Letters Patent to secure, is—

1. The combination of the distributer A, having induction and eduction ports, the follower N, adapted to reciprocate vertically within the distributer A to open and close the eduction-ports, a spring, 5, adapted to keep said ports normally open, and automatic mechanism for operating the said follower to close the said ports, substantially as described.

2. The combination of the distributer A, the follower N, and described means consisting of spring 5, float 10, tank T, and connecting mechanisms for effecting the movement of the follower N to open and close the ports of the distributer, substantially as described.

3. The combination of the induction-pipe F, the distributer A, having eduction-ports, the follower N, adapted to operate to open and close said eduction-ports, and the elastic cushion 20, substantially as described.

4. In combination with the distributer having interior chamber and ports, substantially as described, the follower located in said chamber and having grooved chamber 21, substantially as described.

5. In an organized mechanism of substantially the construction described, and in combination, a device for distributing fluid, having an induction-port for receiving fluid and eduction-ports for discharging fluid, a supply-pipe connecting with the induction-port and a delivery-pipe communicating with all but one of the eduction-ports, a measuring device communicating with the one eduction-port and adapted to measure the fluid discharged therefrom, a tank communicating with the delivery-pipe and adapted to receive fluid therefrom, mechanism for opening and closing the ports of the distributing device or for shutting it off altogether, said means being in communication with the water in the tank and adapted to be set in motion by the rising and falling of this water, substantially as described.

D. A. SUTHERLAND.

Witnesses:
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